

Southern Pine Beetle Biology and Prevention

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HOST: All species of pine, but prefer loblolly, shortleaf, Virginia, pond and pitch pines.

IMPORTANCE: The southern pine beetle (*Dendroctonus frontalis*) is the most destructive forest insect in the South. Weakening of trees by flooding, windstorms, and especially drought commonly precedes outbreaks. Trees of all sizes are attacked, but usually trees larger than six inches in diameter are infested first.

IDENTIFICATION: The brown to black beetle is about 1/8 inch long. Its hind end is rounded, in contrast to the scooped out posterior of the Ips beetle. Larvae are white with a reddish-brown head and the pupae pure white. Fully-grown larvae and pupae are approximately 1/8 inch in length. Eggs are white, and easily visible to the eye.



SIGNS OF ATTACK: The first indication of attack is usually yellowing or browning of needles. The trunk will usually reveal white, yellow or sometimes red-brown pitch tubes, about as large as a wad of gum. Under drought conditions, pitch tubes may be very small or absent, and only reddish-brown boring dust will be present. Removal of the bark will show a distinctive winding "S" shaped gallery pattern. This pattern is quite different from the "Y" or "H" shaped gallery patterns of the Ips beetle and is a good identification characteristic. In active spots, trees in the center have dark reddish-brown foliage. Foliage will change to light greenish or yellowish green on the edges of active spots.

LIFE CYCLE: Adult beetles are usually attracted to weakened trees. In epidemics, they attack trees that appear healthy and vigorous. Initial attacks are in the mid-trunk and then the length of the tree. Adult beetles bore through the bark and excavate long winding "S" shaped galleries. Eggs are laid in niches along the galleries. Larvae feed in the cambium until grown, and then excavate cells near the bark surface in which to pupate. After pupation, adult beetles chew through the bark and emerge. The complete cycle of the attack takes from 25 to 40 days, depending on the temperature.



Red-topped pines in SPB spot

CONTROL: Research has led to a better understanding of the beetle and its relationship to the tree and the stand. With this information, we can prevent beetle attack or more effectively manage an outbreak.

The goal of an SPB prevention program is to identify pine stands growing under conditions preferred by the beetle. High hazard stands should be managed to favor vigorous tree growth and promote natural resistance to beetles.

To rate a pine stand for SPB hazard, obtain information on pine basal area, total basal area, stand age and site index. This information is taken at each plot, with plots generally five chains apart (each plot represents approximately 2.5 acres) and put into a formula to determine the score associated with a hazard class. The following formula determines SPB hazard for a stand.

$$\text{Score} = 1.8342 (\text{Pine BA}) + 0.4085 (\text{Total BA}) + 0.705 (\text{Age}) + 0.88 (\text{Site Index}) - 206.315$$

Where:	220 or above	Very High
	168 to 219	High
	62 to 167	Medium
	11 to 61	Low
	10 to 0	Very Low



High SPB hazard stand

Example: If total basal area is 130 sq. ft./acre, pine basal area is 120 sq. ft./acre, stand age is 27 years, and site index is 109.

$$\text{Score} = (1.8342 \times 120) + (0.4085 \times 130) + (0.705 \times 27) + (0.88 \times 109) - 206.315 = 181.85$$

The score of 181.85 is between 168 to 219 means the relative hazard rating is "High."

To reduce SPB losses in pine stands rated as medium or high hazard, consult a registered forester for management advice. Depending on the stand, the forester may recommend one or more of the following actions:

- Thin to basal areas of 70-100 sq. ft./acre to promote rapid tree growth and resistance to beetles.
- On sandy soils, use borax on tree stumps to prevent annosus root rot.
- Harvest and regenerate over-mature stands.
- Conduct a prescribed burn to reduce plant competition.
- Treat unwanted hardwoods in the pine stand with herbicide to reduce competition.
- When practical, remove high hazard trees preferred by beetles, e.g., those damaged by lightning, ice, logging or other pests.



After thinning high SPB hazard stand.

Photo Credits: A Field Guide for Ground Checking Southern Pine Beetle Spots, Handbook No. 558, Tim Tigner, Virginia Department of Forestry, www.forestryimages.org, and Wes Nettleton, USFS, Region 8



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